Notice No.4

Rules and Regulations for the Classification of Ships, July 2022

The status of this Rule set is amended as shown and is now to be read in conjunction with this and prior Notices. Any corrigenda included in the Notice are effective immediately.

Please note that corrigenda amends to paragraphs, Tables and Figures are not shown in their entirety.

Issue date: December 2022

Amendments to	Effective date	IACS/IMO implementation (if applicable)
Part 5, Chapter 4, Section 8	1 January 2023	1 January 2023
Part 5, Chapter 12, Section 2	1 January 2023	1 January 2023
Part 6, Chapter 1, Section 7	1 January 2023	N/A
Part 6, Chapter 2, Sections 1, 5, 7, 10 & 21	1 January 2023	N/A
Part 8, Chapter 2, Section 7	1 July 2023	1 July 2023
Part 8, Chapter 2, Section 9	1 January 2023	N/A

Part 5, Chapter 4
Gas Turbine

■ *Section 8*
Control, alarm and safety systems

8.9 Gas turbine machinery

Table 4.8.1 Gas turbine machinery: Alarms and safeguards

Item	Alarm	Note
Overspeed	High	Automatic shutdown *see also Pt 5, Ch 4, 8.2 Overspeed protection and shutdown system*
Power turbine inlet temperature	1st stage high	Automatic power reduction
	2nd stage high	Automatic shutdown *see also Pt 5, Ch 4, 8.3 Power turbine inlet over-temperature control*
Flame failure	Failure	Automatic shutdown, *see also Pt 5, Ch 4, 8.4 Flameout*
Failure to ignite	Failure	Automatic shutdown, *see also Pt 5, Ch 4, 8.4 Flameout*
Lubricating oil pressure	1st stage low	-
	2nd stage low	Automatic shutdown, *see also Pt 5, Ch 4, 8.5 Lubricating oil system*
Lubricating oil temperature	High	*See also Pt 5, Ch 4, 8.5 Lubricating oil system*
Lubricating oil filter differential pressure	High	-
Scavenge oil temperature	High	-
Scavenge oil pressure	Low	*Automatic shutdown*
Bearing temperature	High	-
Turbine vibration	1st stage high	-
	2nd stage high	Automatic shutdown, *see also Pt 5, Ch 4, 4.2 Vibration*
Fuel oil supply pressure	Low	-
Fuel oil supply temperature	High	-
Fuel oil leakage	High	*See also Pt 5, Ch 4, 5.2 Fuel oil systems*
Automatic starting	Failure	*Automatic shutdown*
Control system	Failure	*Automatic shutdown*
Air intake pressure	Low	*See also Pt 5, Ch 4, 4.4 Intake and exhaust ducts 4.4.4*
Feed water or water/thermal fluid forced circulation flow (if fitted)	Low	*See Pt 5, Ch 14, 6.2 Feed and circulation pumps 6.2.7* and Note 4
Uptake temperature	High	*To monitor for soot fires. See Notes 4 and 5*

Note *1.* For two-stage alarms, *see also Pt 5, Ch 4, 8.8 Unattended machinery 8.8.4*.
Note *2.* For requirements on purging before ignition, *see Pt 5, Ch 4, 6.2 Purging before ignition 6.2.1*.
Note *3.* Where a requirement for disabling the automatic protection and safety system devices for machinery and engineering systems has been defined by the Owner, the consequences of using the disabling arrangements are to be established and included in the operations procedures and orders provided on board ship. Details of any disabling arrangements are to be submitted to LR for consideration in each instance.
Note *4.* Alarm is required only when suitable for operation on residual fuel grades and an exhaust gas economiser/boiler/thermal oil heater is fitted.
Note *5.* Alternatively, details of an appropriate fire detection system are to be submitted for consideration.
Note *6*. The Table contains the minimum list of alarms and shutdowns required for a gas turbine. Additional alarms and shutdowns may be necessary as determined through risk-mitigating activities in response to the completed Risk-Based Analysis (e.g. FMEA) for the gas turbine.
Note *7*. If specific alarms and shutdowns are not applicable for the gas turbine, sufficient evidence shall be produced to support such claims (e.g. Risk-Based Analysis such as FMEA).

Part 5, Chapter 12
Piping Design Requirements

■ *Section 2*
Carbon and low alloy steel

2.14 Carbon dioxide (CO2) fire-extinguishing system piping

2.14.2 Where a low-pressure CO_2 system is fitted, the piping system is to be designed in such a way that the CO_2 pressure at the nozzles is not less than 1 N/mm^2.

Existing paragraphs 2.14.2 to 2.14.10 have been renumbered 2.14.3 to 2.14.11.

Part 6, Chapter 1
Control Engineering Systems

■ *Section 7*
Trials

7.2 Unattended machinery space operation – UMS notation

(Part only shown)

7.2.1 In addition to the tests required by *Pt 6, Ch 1, 7.1 General*, the suitability of the installation for operation in the unattended mode is to be demonstrated during sea trials over a four to six hour period observing the following:

(c) Stable operation in, and transition between, power plant configuration modes which are not considered as manual operations (*see Pt 6, Ch 2, 1.2 Documentation required for design review*). The trial time of each operating mode for the electrical power system is to be sufficient to demonstrate that the transitions can be performed with an unattended engine room, and a stable running condition achieved.

Part 6, Chapter 2
Electrical Engineering

■ *Section 1*
General requirements

1.2 Documentation required for design review

(Part only shown)

1.2.17 **Lithium battery systems**. In addition to the plans and information required by *Pt 6, Ch 1, 1.2 Documentation required for design review 1.2.2*, the following information is also to be submitted:

(k) Fire integrity plans for the battery space (including penetrations drawings), contiguous spaces and means of escape from the battery space.

(l) Test schedule for works testing which is to include methods of testing and acceptance criteria.

1.4 Surveys

(Part only shown)

1.4.2 The following equipment, where intended for use for essential and emergency services, is to be surveyed by the Surveyors during manufacture and testing:

- Switchboards and section boards; ~~and~~
- UPS units of 50 kVA and over; and
- Lithium Battery Systems of capacity 50 kWh and over including associated Battery Management Systems.

1.11 Location and construction

1.11.1 All electrical equipment is to be constructed or selected, and installed such that:

(a) live parts cannot be inadvertently touched, unless they are supplied at the safety voltage specified in *Pt 6, Ch 2, 1.12 Earthing of non-current carrying parts 1.12.2.(h)*;

(b) it does not cause injury when handled or touched in the normal manner; and

(c) it is unaffected by any water, steam or oil and oil vapour to which it is likely to be exposed.

Electrical equipment having, as a minimum, the degrees of protection as specified in IEC 60092-201: *Electrical Installations In Ships – Part 201: System Design – General* for the relevant location will satisfy these requirements. For high voltage electrical equipment, the degrees of protection as specified in IEC 60092-503: *Electrical installations in ships – Part 503: Special features – AC supply systems with voltages in the range of above 1kV up to and including 36kV* for the relevant location will satisfy these requirements.

■ *Section 5*
Supply and distribution

5.1 Systems of supply and distribution

5.1.3 System voltages for both alternating current and direct current in general are not to exceed:

- 35000 V for power distribution;
- 15000 V for generation and propulsion ~~and power distribution~~;
- 500 V for cooking and heating equipment permanently connected to fixed wiring;
- 250 V for lighting, heaters in cabins and public rooms, and other applications not mentioned above.

Voltages above these will be the subject of special consideration.

5.3 Isolation and switching

5.3.11 High voltage switchgear and controlgear assemblies that use liquids or gasses other than ambient air as an insulating medium are to be installed in spaces that are adequately protected according to the following requirements:

- The space is to be provided with ventilation to ensure that gasses cannot accumulate unnoticed.
- Leakages of liquid are to be properly collected and contained.
- An alarm is to be initiated at a manned control station to indicate when the insulating medium has reduced to an abnormally low level. Interlocks are to be provided to ensure that the switchgear or controlgear cannot be closed when this alarm is active. The interlocks are to ensure that services essential for the propulsion and safety of the ship are not disconnected in the event of this alarm being activated.

■ *Section 7*
Switchgear and controlgear assemblies

7.1 General requirements

(Part only shown)

7.1.1 Switchgear and controlgear assemblies and their components are to comply with the following standards, as appropriate for the nominal voltage and~~,~~ amended where necessary for ambient temperature and other environmental conditions:

(d) IEC 60092-503: *Electrical installations in ships – Part 503: Special features – AC supply systems with voltages in the range of above 1 kV up to and including ~~15~~36kV*;

7.5 Creepage and clearance distances

(Part only shown)

Table 2.7.1 Minimum clearance distances

Nominal voltage (V)	Minimum clearance distance (mm)		
	Verified assemblies, *see* Note 2		Non-verified assemblies
	Main switchboards	Other switchgear and controlgear	Main switchboards and other switch and controlgear
≤15,000	*See* Note 3	*See* Note 3	160
≤22,000	*See* Note 3	*See* Note 3	220
≤33,000	*See* Note 3	*See* Note 3	320
≤35,000	*See* Note 3	*See* Note 3	360
Note *3* Clearance distances, with reference to the applicable relevant National or International Standards, are to be submitted for approval, *see Pt 6, Ch 2, 1.3 Documentation required for supporting evidence 1.3.4*.			

(Part only shown)

7.5.3 For assemblies with a rated voltage above 1kV, the requirement of *Pt 6, Ch 2, 7.5 Creepage and clearance distances 7.5.1* may be met by complying with IEC 60092-503 *Electrical installations in ships – Part 503: Special features – AC supply systems with voltages in the range of above 1 kV up to and including ~~15~~36kV*.

(Part only shown)

Table 2.7.2 Minimum creepage distances

Nominal voltage (V)	Minimum creepage distance (mm)	
	Main switchboards	Other switchgear and controlgear
≤15, 000	*See* Note 2	*See* Note 2
≤35, 000	*See* Note 2	*See* Note 2
Note *2* Creepage distances, with reference to the applicable relevant National or International Standards, are to be submitted for approval, *see Pt 6, Ch 2, 1.3 Documentation required for supporting evidence 1.3.3*.		

■ *Section 10*
Converter equipment

10.1 Transformers

(Part only shown)

10.1.2 Transformers are to comply with the requirements of the following standards:

(b) IEC 60092-503: *Electrical installations in ships – Part 503: Special features – AC supply systems with voltages in the range of above 1 kV up to and including ~~15~~36kV~~;~~*; or

■ *Section 21*
Testing and trials

21.1 Testing

Table 2.21.1 Test voltage

Rated voltage, ~~U_n~~ U_n ~~U_n~~ V	Test voltage a.c. (r.m.s.), V
~~U_n~~ U_n ≤ 60	500
60 < ~~U_n~~ U_n ≤ 1000	2~~x~~ ~~U_n~~ U_n + 1000
1000 < ~~U_n~~ U_n ≤ 2500	6500
2500 < ~~U_n~~ U_n ≤ 3500	10000
3500 < ~~U_n~~ U_n ≤ 7200	20000
7200 < ~~U_n~~ U_n ≤ 12000	28000
12000 < ~~U_n~~ U_n ≤ 15000	38000
15000 < U_n ≤ 22000	50000
22000 < U_n ≤ 33000	70000
33000 < U_n ≤ 35000	80000

Table 2.21.2 Test voltage and minimum insulation

Rated voltage ~~U_n~~ V	Minimum voltage of the tests, V	Minimum insulation resistance, MΩ
~~U_n~~ ≤ 250	2~~x~~ ~~U_n~~	1
250 < ~~U_n~~ ≤ 1000	500	1
1000 < ~~U_n~~ ≤ 7200	1000	~~$\frac{U_n}{1000}+1$~~ $\frac{U_n}{1000}+1$
7200 < ~~U_n~~ ≤ 15000	5000	~~$\frac{U_n}{1000}+1$~~ $\frac{U_n}{1000}+1$
U_n > 15000	5000	$\frac{U_n}{1000}+1$

21.1.6 Tests at the manufacturers' works and trials after installation on board are to include such tests necessary to demonstrate, ~~to the Surveyor's satisfaction~~, the suitability and safety of the lithium battery system for its intended duty and location. As a minimum, the tests listed in *Table 2.21.3 Test requirements on lithium battery systems* are required:

Table 2.21.3 Test requirements on lithium battery systems

Item	Tests	Trials
~~Discharge performance validation~~	~~X~~	
~~Capacity validation~~ Performance test~~*~~	X	~~X~~
~~Internal d.c. resistance test~~	~~X~~	
~~Overcharge control test~~	~~X~~	
~~Cell balancing functional test~~	~~X~~	
Sensor failures test	X	
SOC ~~validation~~ indication test ~~*~~	X	X
SOH ~~validation~~ indication test~~*~~	X	X
High voltage test	X	
Insulation resistance test	X	
Required alarms and safeguards	X	X
~~Emergency trip functional test *~~	~~X~~	~~X~~
~~Over-temperature protection test~~	~~X~~	~~X~~
~~Over-voltage protection test~~	~~X~~	~~X~~
~~Under-voltage protection test~~	~~X~~	~~X~~
Communication failure between BMS and external charge control system test ~~*~~	X	X
~~Pressure relief valve test~~	~~X~~	
~~Additional safety functions tests and trials of the battery management system~~	~~X~~	~~X~~
Verification of thermal management at maximum achievable load under service conditions during trials		X
Tests of the safety functions in the battery compartment, i.e., fire detection and extinguishing, gas detection, off-gas exhaust/extraction, ventilation etc as applicable to the installation.		X
~~Note . Items marked * are required to be tested annually.~~		

21.2 Trials

(Part only shown)

21.2.4 It is to be demonstrated that the Rules have been complied with in respect of:

(a) satisfactory performance of each electrical propulsion, essential auxiliary or emergency power source including its ancillary services ~~generator~~ throughout a run at full rated load;

(k) operation of power management for electric propulsion; and

(l) satisfactory performance of each electrical propulsion, essential auxiliary or emergency energy store including its auxiliary services throughout a run at full rated charging capacity.

Part 8
Chapter 2 Ice Operations - Ice Class

■ *Section 7*
Machinery requirements for first-year ice conditions – Ice Classes 1AS FS(+), IAS FS, 1A FS, 1A FS(+), 1B FS, 1B FS(+), 1C FS(+) and 1C FS

7.8 Screwshafts

7.8.4 For screwshafts in ships intended for the notation **Ice Class 1AS FS(+), IAS FS** or **Ice Class 1A FS, 1A FS(+)** or **Ice Class 1B FS, 1B FS(+)** or **Ice Class 1C FS, 1C FS(+)** and where the connection between the propeller and the screwshaft is by means of a key, Charpy impact tests are to be made in accordance with the requirements of the *Rules for the Manufacture, Testing and Certification of Materials, Ch 5, 3.4 Table 5.3.2 Mechanical properties for acceptance purposes: carbon, carbon-manganese and alloy steel forgings for machinery and shafting* ~~*Ch 5, 3.4 Mechanical tests 3.4.12*~~ ~~of the Rules for Materials~~.

■ *Section 9*
Machinery requirements for first-year ice conditions - Ice classes 1AS FS(+), IAS FS, 1A FS(+), 1A FS, 1B FS(+), 1B FS, ~~and~~ 1C FS(+) and 1C FS

9.2 Materials for shafting

9.2.1 For screwshafts in ships intended for the following notations: **Ice Class 1AS FS(+)** ~~**or Ice Class**~~ **IAS FS, 1A FS(+), 1A FS, 1B FS(+), 1B FS, 1C FS(+), 1C FS;** and where the connection between the propeller and the screwshaft is by means of a key, Charpy impact tests are to be made in accordance with the requirements of the *Rules for the Manufacture, Testing and Certification of Materials, Ch 5, 3.4 Table 5.3.2 Mechanical properties for acceptance purposes: carbon, carbon-manganese and alloy steel forgings for machinery and shafting* ~~*Ch 5, 3.4 Mechanical tests 3.4.12*~~ ~~of the Rules for Materials~~.

© Lloyd’s Register Group Limited 2022
Published by Lloyd’s Register Group Limited
Registered office (Reg. no. 08126909)
71 Fenchurch Street, London, EC3M 4BS
United Kingdom

Lloyd’s Register and variants of it are trading names of Lloyd’s Register Group Limited, its subsidiaries and affiliates. For further details please see http://www.lr.org/entities

Lloyd’s Register Group Limited, its subsidiaries and affiliates and their respective officers, employees or agents are, individually and collectively, referred to in this clause as ‘Lloyd's Register’. Lloyd's Register assumes no responsibility and shall not be liable to any person for any loss, damage or expense caused by reliance on the information or advice in this document or howsoever provided, unless that person has signed a contract with the relevant Lloyd's Register entity for the provision of this information or advice and in that case any responsibility or liability is exclusively on the terms and conditions set out in that contract.